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MOTOR VEHICLE HATCH WITH A STORABLE REAR WINDOW

The invention concerns a motor vehicle with a hatch that includes a rear window, wherein the rear window can be moved separately into a released position, in accordance with the introductory clause of Claim 1.

DE 296 22 436 U1 discloses a motor vehicle that has a hatch with a rear window, which, to improve the open-air feeling for the occupants of the vehicle, can be moved downward into a lower region of the hatch and thus opens the space that it occupies in its closed position. This type of displacement of the rear window is possible only if the lower region of the hatch has a sufficiently bend-free height for receiving the window, which is usually possible only for vehicles with vertical hatches or vehicles with oblique hatches that extend a very long distance downward.

The objective of the invention is to expand the design possibilities for designers in vehicles of the aforementioned type.

The invention solves this problem with a motor vehicle with the features of Claim 1 and with a movable hatch with the features of Claim 11. Additional advantageous refinements of the invention are specified in Claims 2 to 10.

The invention achieves independence of the design of the region of the hatch situated below the rear window from the requirement that a space for housing the opened rear window be made available. Therefore, the lower region can be designed, for example, as a relatively narrow sector or as a region with multiple bends and can have a vertical extent that is considerably smaller than the vertical extent of the rear window.

In this regard, if the closed position and the released position of the rear window and its displacement can be brought about with vehicle-side support of the rear window, the operation is greatly simplified; in addition, in this case there is no danger that a user operating a completely released window can damage it.

If the rear window can be lowered with the hatch in the open position, cost-effective manual operation can be simplified, for example, by virtue of the fact that the open hatch is acted on from the side that is on the inside when the

hatch is closed. In this regard, lowering kinematics for conveying the rear window into its released position are possible, which only slightly touches the luggage compartment situated below, even during the lowering movement.

In particular, it is advantageous, to preserve the luggage space, if the rear window is held almost vertically in the released position, say, behind the backrests of a rear seat.

With an essentially U-shaped design of the hatch outside the rear window, when the window is in the released position, the hatch can form a large, opening that extends continuously towards the front without interruption by a transverse support. The open-air feeling is especially pronounced in this case. In particular, the open-air feeling is improved if, in the closed position of the rear window, its upper and front edge (with respect to the direction of travel of the vehicle) is followed by at least one additional panel section that can be moved for opening.

Further advantages and features of the invention are apparent from the specific embodiments of the object of the invention that are schematically illustrated in the drawings and described below.

-- Figure 1 shows an oblique rear perspective view of a motor vehicle of the invention with a closed rear window and a hatch in the closed position and with two other movable panel sections in front of the upper and front edge of the hatch (with respect to the direction of travel of the vehicle).

-- Figure 2 shows a view similar to that of Figure 1 after the forwardmost panel section has been opened.

-- Figure 3 shows a view similar to that of Figure 2 with the hatch in the open position.

-- Figure 4 shows a view similar to that of Figure 3 during the opening of the two front panel sections.

-- Figure 5 shows a view similar to that of Figure 4 with further progression of the opening of the front panel sections.

-- Figure 6 shows a view similar to that of Figure 5 with the front panel sections lowered essentially vertically into the automobile body.

-- Figure 7 shows a view similar to that of Figure 6 with the rear window also lowered in its released position in the automobile body.

-- Figure 8 shows a view similar to that of Figure 7 after the hatch has been closed.

-- Figure 9 shows a schematic side view of the vehicle in

the roof position according to Figure 1.

-- Figure 10 shows a view similar to that of Figure 9 but after the forwardmost panel section has been opened corresponding to the roof position of Figure 2.

-- Figure 11 shows a view similar to that of Figure 10 but with the hatch in the open position corresponding to the roof position of Figure 3.

-- Figure 12 shows a view similar to that of Figure 11 but during the opening of the two front panel sections corresponding to the roof position of Figure 4.

-- Figure 13 shows a view similar to that of Figure 12 but during further progression of the opening of the front panel sections corresponding to the roof position of Figure 5.

-- Figure 14 shows a view similar to that of Figure 9 but with completely opened front panel sections corresponding to the roof position of Figure 6.

-- Figure 15 shows a view similar to that of Figure 14 but as the rear window is being swung out of its closed position in the hatch.

-- Figure 16 shows a view similar to that of Figure 15 with further progression of the opening of the rear window.

-- Figure 17 shows a view similar to that of Figure 16 with

the rear window completely in its released position corresponding to the position of Figure 7.

-- Figure 18 shows a view similar to that of Figure 17 after the hatch has been moved into its closed position corresponding to the position of Figure 8.

-- Figure 19 shows an alternative design of the kinematic system for conveying the rear window into the released position, wherein the kinematic system contains separate lateral guide rails, with the front panel sections lowered and the hatch closed with the rear window in the closed position.

-- Figure 20 shows a view similar to that of Figure 19 with the hatch opened.

-- Figure 21 shows a view similar to that of Figure 20 during the movement of the rear window out of the parts of the hatch that surround it into the released position.

-- Figure 22 shows a view similar to that of Figure 21 with the rear window in its released position.

-- Figure 23 shows a view similar to that of Figure 22 after the hatch has been closed.

The drawings generally show a four-seat or five-seat motor vehicle 1 with a rear seat. However, this is not required. For example, a two-seat motor vehicle can also be designed in

accordance with the invention.

The vehicle 1 has side windows 2 that are bounded above by intrinsically rigid roof rails 3, which, as viewed from above, run essentially lengthwise in the longitudinal direction of the vehicle between a windshield frame 4 and the rear section 5 of the vehicle, and which have a curved shape as viewed from the side. These roof rails are part of the automobile body 6.

The rear section 5 has a hatch H1. The hatch H1 has an essentially U-shaped design here with a lower crosspiece H2, which can contain, for example, parts of the taillights and/or a license plate mount, and with side pieces H3, which, in the closed position of the hatch H1, are directed forward and upward in the direction of vehicle travel F and follow the curve of the roof rails 3. An especially rigid rear window H4, which can consist, for example, of plastic or, advantageously, glass, is held between the parts H2 and H3 in its closed position. In this position, the side pieces H3 thus serve as lateral frame parts of the rear window H4. The upper and forward edge H5 of the rear window H4 in the direction of vehicle travel F simultaneously forms the upper and forward edge of the hatch H1 and is not supported from below by a transverse support due to the U-shape of the hatch H1.

The hatch H1 is movably supported all together between a closed position (Figure 1) and an open position (Figure 3). The opening movement is not a pure swinging movement but rather occurs in such a way that in its open position, the front edge H5 of the hatch H1 is moved towards the rear relative to its closed position. For this purpose, the hatch H1 is supported (Figures 9 ff.) on each side of the vehicle, for example, by a multijoint linkage, which in the present case is a four-bar linkage H6. The links H7 and H8 of the linkage H6 are each articulated laterally in the automobile body 6, for example, in the rear region of the roof rails 3.

The rear window H4 can be lowered from the open position of the hatch H1 shown in Figures 3 and 12 into its separate released position in the automobile body 6.

For this purpose, in a first embodiment, the rear window H4 is connected with the automobile body 6 by linkage parts H9, H10 arranged laterally in the body 6. Linkage part H9 is a cylinder that can be extended and retracted. Due to its length variability, even when the rear window H4 is closed, the linkage part H9 is able to move along with the opening movement of the hatch H1, which then encloses the rear window (transition from Figure 1 to Figure 3).

The cylinder H9 is articulated at one end to the automobile body 6. Its free end acts on another link H10, which is articulated higher in the automobile body 6, and this point of application of force to the link H10 by the link H9 is located some distance from the articulation H11 of the link H10, so that a lever arm is produced.

The free end of the link H10 acts laterally to the upper edge H5 of the rear window H4. To move the rear window H4 into its released position, the rear window H4 is first unlocked at its end H12, which forms the lower edge in the closed position, from the lower crosspiece H2 of the hatch H1 (transition from Figure 14 to Figure 15), and the rear window H4 can be manually held by a user at its lateral edges H13 and manually moved almost parallel downward (Figure 16). During this operation, the lever H10 is swung downward about the joint H11, and the cylinder H9 retracts and swings forward. All together, the rear window H4 is thus lowered at least almost vertically and displaced slightly forward to save space. In its lowered position, it is stowed with other roof parts as a group, which will be explained in greater detail below.

In this released position (Figure 17), the rear window H4 is held below a lateral belt line 7 of the automobile body 6

some distance from the hatch H1. The space between the side pieces H3 and the lower crosspiece H2 of the hatch H1 is completely opened. The hatch H1 can then be closed again (Figure 18).

In a second embodiment (Figure 19 to Figure 23), the rear window H4 can be moved into its released position by lateral guide rail sections H14, H15. The guide rail H14, H15 is divided into two sections to allow its continuation over the roof rails 3 when the hatch H1 is open (Figure 20) but also to allow the hatch H1 to ride over the guide rail when the hatch H1 is closed (Figure 19). The first section H14 of the guide rail is coordinated with the four-bar linkage H6 and is moved into an upright position by a first link H7 when the hatch H1 is opened, which causes it to become automatically aligned with the lower section H15 of the guide rail, which is fixed in the automobile body 6 (transition from Figure 19 to Figure 20).

Here again, to move the rear window H4 into its released position, the rear window H4 is first unlocked at its end H12, which forms the lower edge in the closed position, from the lower crosspiece H2 of the hatch H1 (transition from Figure 20 to Figure 21), and the rear window H4 is manually held by a user at its lateral edges H13 and can be manually moved almost

parallel downward in the guide rail H14, H15 by means of bearing journals H16 located in the lateral region of the upper edge H5 (Figure 21).

In this embodiment as well, all together, the rear window H4 is lowered at least almost vertically into its released position, in which it is displaced slightly forward to save space, and is held below a lateral belt line 7 of the automobile body 6. The hatch H1 can then be closed again (Figure 23).

In the illustrated embodiments, in the closed position of the rear window H4 (Figure 1), the motor vehicle 1 has additional movable panel sections P1, P2 immediately in front of the front edge H5 of the rear window H4 with respect to the direction of vehicle travel. The number of these panels is variable, depending on the length of the roof. In the closed state, they are arranged essentially horizontally one behind the other, are flush with each other and are flush with the rear window H4. They are supported directly or indirectly on the lateral roof rails 3. The (in this case) two roof sections P1 and P2 can be made of various materials, such as metallic, glass or plastic materials. In particular, they can be essentially transparent materials. In this regard, to prevent "shadow stripes" in the interior as much as possible, it is advisable

that the roof sections P1, P2 not be made too narrow in the longitudinal direction of the vehicle. Therefore, a minimum length of 40 cm in the longitudinal direction of the vehicle is advantageous.

The front roof section P1 can be moved in the manner of a sliding sunroof from the closed position to a position over the rear roof section P2. In its opened position, it rests essentially parallel on roof section P2 (Figures 2 ff.). The position of the roof sections P1, P2 produced in this way represents a possible permanent driving position. However, from this position, the roof can be opened further with a downward displacement of the combined stack P3 of roof sections P1 and P2, which is lowered within the automobile body 6.

For this purpose, the stacked group of roof sections P3 formed in this way is supported in the rear region of the rear roof section P2 by two guide rollers P4, P5 arranged one behind the other in a lateral guide rail P6.

When the operation of lowering the stack of roof sections P3 in the automobile body 6 begins (transition from Figure 11 to Figure 12), the front roller P4 of the pair of guide rollers P4, P5 runs towards the rear on an upwardly directed guideway section P7, whereas the rear guide roller P5 initially runs in

an almost horizontal guideway section P8. At point P9, the section P8 enters the gently curved, downwardly running section P10 of the guide rail P6.

Due to the rearwardly and upwardly directed slope of the section P7, as the stack of roof sections P3 starts to move, its forward edge P11 is immediately raised, so that the head clearance, even for passengers sitting in the back seat, does not during any phase of the movement fall below the amount of head clearance present when the roof sections P1, P2 are closed.

When the rear guide roller P5 enters section P10, the front guide roller P4 runs in a section of the guideway P6 that follows the curve of the lateral roof rails 3, so that with the almost vertical downward movement of the rear guide roller P5, the steep orientation of the stack of roof sections P3 increases, and when the front guide roller P4 also enters the section P10, the stack P3 assumes an almost vertical position (Figure 13). In this position, it can slide downward to the inner vehicle base P12 and assume an almost vertical position slightly behind the backrests P13 of the second row of seats to save space (Figure 14).

The closing of the roof sections P1, P2 proceeds correspondingly but in the opposite direction, and in this

operation as well, the head clearance does not during any phase of the movement fall below the amount of head clearance present when the roof sections are closed. The vehicle silhouette can thus be kept very flat and sporty.

If the front roof section P1 borders directly on the windshield frame 4, a very large roof opening can be created. The lateral autobody sections 3 above the side windows can also be designed very narrow, so that the width of the panel sections P1 and P2 can extend almost to the upper edge of the side windows.

To facilitate the lowering of the roof sections P1 and P2, the hatch H1, as has already been described, can open in such a way that in its open position, the front edge H5 is displaced to the rear relative to its closed position. This results in a passage space D1 in front of the opened hatch H1 with respect to the direction of vehicle travel F, and this passage space D1 lies completely behind the rear edge of the rear roof section P2 in its closed state. In this way, the lowering path of the stack of roof sections P3 through the interior of the vehicle can be shifted far to the rear in the vehicle 1. Any passengers that may be seated in the back seat are not disturbed by the lowering operation.

In this regard, in the closed state of the hatch H1, the frame parts H3, which laterally frame the rear window H4, can be aligned with the roof rails 3, which follow them towards the front in the direction of travel. A very advantageous visual effect is achieved in this way. In particular, in this case, no gradation is necessary in the inner edge D2 of the specified sections H3, 3 that faces the rear window H4 and the moving roof sections P1, P2, but rather this edge D2 runs straight over the entire interior.

However, when the hatch H1 is opened, a passage space D1 is opened that is wider than the clear width D3 between the inner edges D2. This makes it possible to design the roof sections P1 and P2 very wide. A guide rail P14, which projects laterally beyond the roof section P2 and in which the front roof part P1 is guided in its open position, can additionally enter the interior of the automobile body 6 with the stack of roof sections P3 through the widened passage space D1.

To open the two sections P1 and P2 and the rear window H4, the hatch H1 is first opened to free the passage space D1. The roof sections P1, P2 can then be opened in the manner described above.

Prior to or after this, from the opened position of the hatch H1, the rear window H4 can be opened out of the frame pieces H2, H3 in one of the aforementioned ways and lowered into the interior in a space-saving position parallel to the roof sections P1 and P2. It is also possible to open only the rear window H4; only the front panel section P1; the rear window H4 and the panel section P1; or only the two forward roof sections P1 and P2.

The invention can be used both in vehicles with manually moved roof sections P1, P2, H4 and in vehicles with fully automatically or semiautomatically moved roof sections.